

A SMALL FOSSIL HERPETOFAUNA FROM BARBUDA,
LEEWARD ISLANDS, WITH THE DESCRIPTION
OF A NEW SPECIES OF *HYLA*^{1, 2}

WALTER AUFFENBERG
University of Florida

In the summer of 1958 I was afforded the opportunity of prospecting for vertebrate fossils on Barbuda, British Leeward Islands. During the course of this investigation two caves were found to contain numerous fossilized remains of vertebrate animals, some of which are now extinct. This report deals with only the reptiles and amphibians. Reports on the other vertebrate groups will appear at a later date.

The island of Barbuda is located about 40 miles north of Antigua and east of the main transportation routes of the Lesser Antilles, so that it is infrequently visited by biologists. It is a rather small island, composed almost entirely of a soft, massive Miocene limestone that is riddled with solution pockets, sinkholes and small caves. Physiographically the island can be divided into two areas: (1) the Lowlands, comprising about one half of the total area, is a terraced region ranging from sealevel to about 30 feet, and (2) the Highlands, a terraced area along the southern and eastern coasts, ranging in elevation from about 60 to 200 feet. Almost all of the sinks and caverns are found in this area. Along the southeastern coast the sea has eroded away part of the Highlands, so that a high cliff several miles long has been formed along the shore. The cliff is particularly well developed near Two Foot Bay, where it reaches a height of almost 100 feet. Here the base of the cliff has many small caves produced by a transgressing Pleistocene sea. In addition, the erosion of the cliff exposed many sinkholes and caves produced in the higher terrace at a much earlier time. The deposits formerly contained in these older caves (indicated by small patches of reddish breccia on the walls) have been largely swept out during a period of high sea level. The regressing sea exposed the eroded caverns and they again served as traps for animal re-

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mains. It is in these presumed secondary deposits that the fossil herpetofauna was discovered.

The caves from which the bones were removed are at an elevation of about 30-50 feet above sea level. The elevation of the terrace at the foot of the cliff is about 30 feet. The terrace level may thus be contemporaneous with the Pamlico terrace of southeastern United States. The Pamlico deposits in North America are generally believed to have been laid down during Mid-Wisconsin time. The fossils deposited in the soft, fine, highly phosphatic reddish soil of the caves of Barbuda are thus, in all likelihood, Post Mid-Wisconsin. No *Rattus* were found with the bones, indicating a Pre-Columbian age as the younger limit.

Fossil vertebrates were found in only two caves at Two Foot Bay, though many more were examined. In both instances the bones were in a loose reddish soil a few inches below a very recent accumulation of black to brown earth containing feathers and *Rattus*. Most of the caves in the area contained very little soil. When present it was usually found in smaller crevases and solution holes above the floor of the caverns or shelters. The stratigraphy of the earth in one of the small caves containing fossils follows:

Stratigraphy at Cave I, Two Foot Bay, Barbuda

4. Recent black to brown earth, containing feathers and white to yellow non-mineralized bones of bats and *Rattus* 1-3 inches
Unconformity, indicating loss of at least some of the record.
3. Fine, soft, highly phosphatic reddish brown to red soil containing a large number of bones which are dark brown and heavily mineralized 4-18 inches
2. Light red to yellow slightly phosphatic soil, containing fewer bones, but which are also dark brown and heavily mineralized 6-10 inches
1. Limestone

Most of the vertebrate material reported on in the present paper originated from bed 3. *Megalomys*, a rodent now extinct on Barbuda, was found only in beds 2 and 3. Cave I contained largely smaller vertebrates and is undoubtedly an old owl pellet deposit.

Cave II contained large numbers of *Megalomys* of all sizes and fewer reptiles, amphibians and bats, indicating that the fissure may have been used as a den. In addition, many of the bird bones from this locality seem to represent only a few individuals, so that it may also have been used as a nesting site from time to time.

An analysis of the fossil herpetofaunal material now available from these two localities follows.

AMPHIBIA

The only extant amphibian genera known from the Leeward Islands are *Bufo*, *Leptodactylus* and *Eleutherodactylus*. It is thus interesting that the fossil frog material from Barbuda clearly belongs to a fourth genus. On the basis of many characters it is obvious that the extinct form belongs to the genus *Hyla*. No living species of this genus occur within 500 miles of Barbuda. In the Greater Antilles several forms are known from as far eastward as Hispaniola. To the south the closest records are from Trinidad and Tobago. The St. Lucia record is presumably based on an introduction (Barbour, 1937), though this has not been adequately proven. The relationships of the extinct Barbuda form seem to lie with the Trinidad species, rather than with those from the Greater Antilles. However, not all of the Hispaniolan species have been available for study, as some are quite rare in collections.

The fossil form is referred to the genus *Hyla* on the basis of the lack of a ridge on the dorsal surface of the shaft of the ilium (as is found in *Rana*, *Eleutherodactylus*, *Leptodactylus*, etc.) and the lateral development of the protuberance of the dorsal prominence of the same element. The Bufonidae are usually provided with a well developed dorsal prominence, but the protuberance, if present, is directed dorsally rather than laterally.

In all of the Greater Antillean species of *Hyla* which I have examined the dorsal prominence is directed dorsally. In all of the Trinidadian species the process is bent laterally towards the external surface of the element. The protuberance is placed at the truncated edge of the prominence and also directed laterally. The fossil ilia have been compared with a number of Trinidadian and northern South American hylids and were found to be quite distinctive, forming the basis of the description of a new and extinct species of Lesser Antillean *Hyla*.

Hyla barbudensis new species

Holotype:—University of Florida Collections 2572, a complete ilium, collected July 3, 1958, by Walter Auffenberg and Wayne King.

Type Locality and Horizon:—Cave I, Two Foot Bay, Barbuda, British Leeward Islands; Late Pleistocene or Recent.

Referred Specimens:—UF 2753, eight ilia; UF 2755, various limb elements and one dorsal vertebra; UF 2754, two dentaries. All of this material was collected from the same locality and horizon as the holotype.

Diagnosis:—A small species of extinct *Hyla* from Barbuda, differing from *Hyla maxima*, *H. lanciformis* and *H. punctissima* in being much smaller, and in having a greater angle between the ilial shaft and the anterior edge of the ventral portion of the acetabular expansion. From all of the smaller Trinidadian and northern South American species of *Hyla* I have examined (*H. leucophyllata*, *H. punctata*, *H. goughi*, *H. rubra*) it differs in having a greater angle between the shaft of the ilium and the ventral portion of the acetabular expansion, in having the anterior and posterior edges of the ventral portion of the acetabular expansion nearly parallel, and in having the posterior portion of the dorsal prominence directly above the anterior edge of the raised margin of the acetabulum, rather than posterior to the edge.

The nature of the differences between the extinct species and the recent species examined suggests that although it is related to the South American members of the genus it is distinct and a really close relationship to a particular species cannot be demonstrated at this time. Until much more is known concerning the taxonomy and osteology of the Recent hylids of South America it seems best to defer a comparison with all of the forms until a later date.

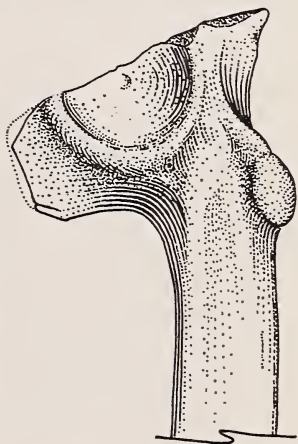


Figure 1. *Hyla barbudensis* new species, Holotype right ilium (UF 2572); Cave I, Two Foot Bay, Barbuda, British Leeward Islands; Late Pleistocene or Recent.

Description of the Type:—A complete left ilium. Shaft only slightly curved, without a dorsal crest. Dorsal prominence low, long, directed externally, with a well developed somewhat elongated protuberance, also directed laterally, the posterior edge above the anterior raised edge of the acetabulum. Acetabulum rounded. Acetabular expansion broad ventrally, with a greater vertical distance anteriorly than posteriorly, the anterior and posterior edges nearly parallel. The ventral edge of this process almost straight, not an obtuse to acute angle as it is in most hylid frogs.

Variation:—The remaining ilia vary only slightly in size. The most conspicuous variable feature is the shape of the dorsal protuberance. It varies from a structure almost perfectly round to one which is greatly elongate. Its position is identical in all of the specimens. Where present the ventral portion of the acetabular expansion is similar to that described in the holotype.

REPTILIA

Thecadactylus rapicaudus

Many jaw, cranial and postcranial elements (UF 2809) from Cave I are referred to this species of large gekkonid lizard. The size of the elements, number and shape of the teeth, etc., of the fossils are indistinguishable from Recent skeletons of the same species. It occurs on Barbuda at the present time.

Of particular interest is the fact that this lizard occurs as a fossil in the Lesser Antilles at all. It has been assumed by some workers to have been transported by man from one island to another. While this may be true, the presence of fossils of this species on Barbuda in a deposit of presumed pre-human occupancy of the island suggests that the genus was widespread at the end of the Pleistocene, having extended its range northward from South America and Trinidad along the Lesser Antillean chain long before this time.

Ameiva griswoldi

A single left dentary from Cave II (UF 2760) is the only element definitely referable to this genus. It differs in no regard from that of an average-sized specimen of this species, to which it is tentatively referred. However, closely related species on other islands of the Leeward group are apparently inseparable from *A. griswoldi* on the basis of osteological material alone. The

species is found on Barbuda at the present time, being one of the most abundant lizards encountered in the field during our visit there. It seems reasonable to refer the fossil to the same genus and species, at least for the present.

Anolis leachii

A very large number of dentaries maxillaries, frontals and various other elements are referred to this genus and species (UF 2756-7). Most of the fossil material representing this form was taken from Cave I, though some elements were also found in Cave II.

Of the species of *Anolis* found on Barbuda today, *leachii* is by far the largest. Medium to large specimens are provided with a considerably roughened area on the external ventral surface of the dentary. It occurs in both sexes, but becomes very pronounced in the older males. It is lacking in the dentaries of the second, and smaller species found on the island at the present time—*A. wattsi*. All of the larger fossil dentaries are provided with this heavily roughend area, so that correct specific identification is assured in at least these specimens. The shape and number of the maxillary teeth, and the shape and sculpturing of various available cranial elements of the fossil form is identical to that in *A. leachii*.

Unfortunately, *A. wattsi* cannot be separated from younger specimens of *A. leachii* on any osteological basis known to me. Some of the smaller dentaries available from the Two Foot Bay caves may belong to *A. wattsi*, but they are not distinguishable.

Pseudoboa cf. *P. cloelia*

Two snake vertebrae (UF 2761) are available from Cave I. It is of interest that these vertebrae do not represent *Alsophis*, the only terrestrial snake genus found in the Leeward Islands today. They are not referable to *Dromicus*, a genus found on Guadeloupe and some of the Greater Antillean islands. They can in no way be construed as being even an extinct relative of any of the remaining genera of snakes of the Greater Antilles.

The elements differ from those of *Alsophis* and *Dromicus* in many regards, chief of which is the fact that the neural spine is

much higher and longer than in these genera, and the centrum is much shorter. They have been compared with all of the remaining Antillean snake genera with the exception of *Darlingtonia*, a rare Hispaniolan genus. It differs greatly from all of these with the exception of *Pseudoboa* to which it seems closely related.

Unfortunately, the vertebrae are not from a fully adult specimen so that it is not possible to determine to which of the two northern South American species of *Pseudoboa* the fossil belongs. The vertebrae bear no strong resemblances to those of the remaining colubrid snakes from Trinidad. They differ from those of *Pseudoboa cloelia* and *P. neuweidii* available for study in being smaller and having a proportionately shorter centrum. However, juvenile and subadult snakes frequently have shorter centra than do adults of the same species, so that the differences are not beyond what might be expected during ontogenesis.

Except for Leptotyphlops, there are no other snakes on Barbuda at the present time. *Alsophis leucomelas* is still found on Montserrat, Antigua and Guadeloupe (Barbour, 1937; Dunn, 1934). Antigua and Barbuda are on the same bank. Whether or not *Alsophis* occurred on Barbuda in the past is, of course, unknown, though it seems logical to assume that it did. The presence of *Pseudoboa* on Barbuda suggests that the present range of many of the reptiles in the Lesser Antilles may have been somewhat restricted near the end of the Pleistocene. It also attests to the movement of South American herpetofaunal elements northward throughout the greater part of the Lesser Antilles during the Pleistocene, as has been suggested in studies of various other animal groups.

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